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Fast timing silicon R&D for the future Electron-Ion Collider

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The proposed Electron-Ion Collider (EIC) will utilize high-luminosity high-energy electron+proton ($e+p$) and electron+nucleus ($e + A$) collisions to solve several fundamental questions including searching for gluon saturation and studying the proton/nuclear structure. High granularity and low material budget silicon vertex and tracking detector with fine spatial resolution is essential to perform a series of high precise measurements at the EIC. Complementary to the ongoing EIC project detector technical design carried out by the ePIC collaboration, several new detector R&D, which aims for the ePIC detector upgrade or the EIC detector II development, has started with the support of the EIC generic R&D project. A Depleted Monolithic Active Pixel Sensor (MALTA2) based fast timing silicon tracking detector has been proposed to provide additional hits for track reconstruction in the far-forward and far-backward region at the EIC to improve the overall track reconstruction quality. The fast timing resolution of the MALTA2 technology will help reject background events at the EIC as well. We will present the detector design of the proposed MALTA2 based far forward/backward tracking detector supported by the EIC generic R&D program, progress of the MALTA2 R&D from bench tests and scheduled beam test at CERN and the development of a new MALTA2 stave design with reduced material budgets. The evaluated impacts on the EIC $e + A$ physics will be present as well.

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